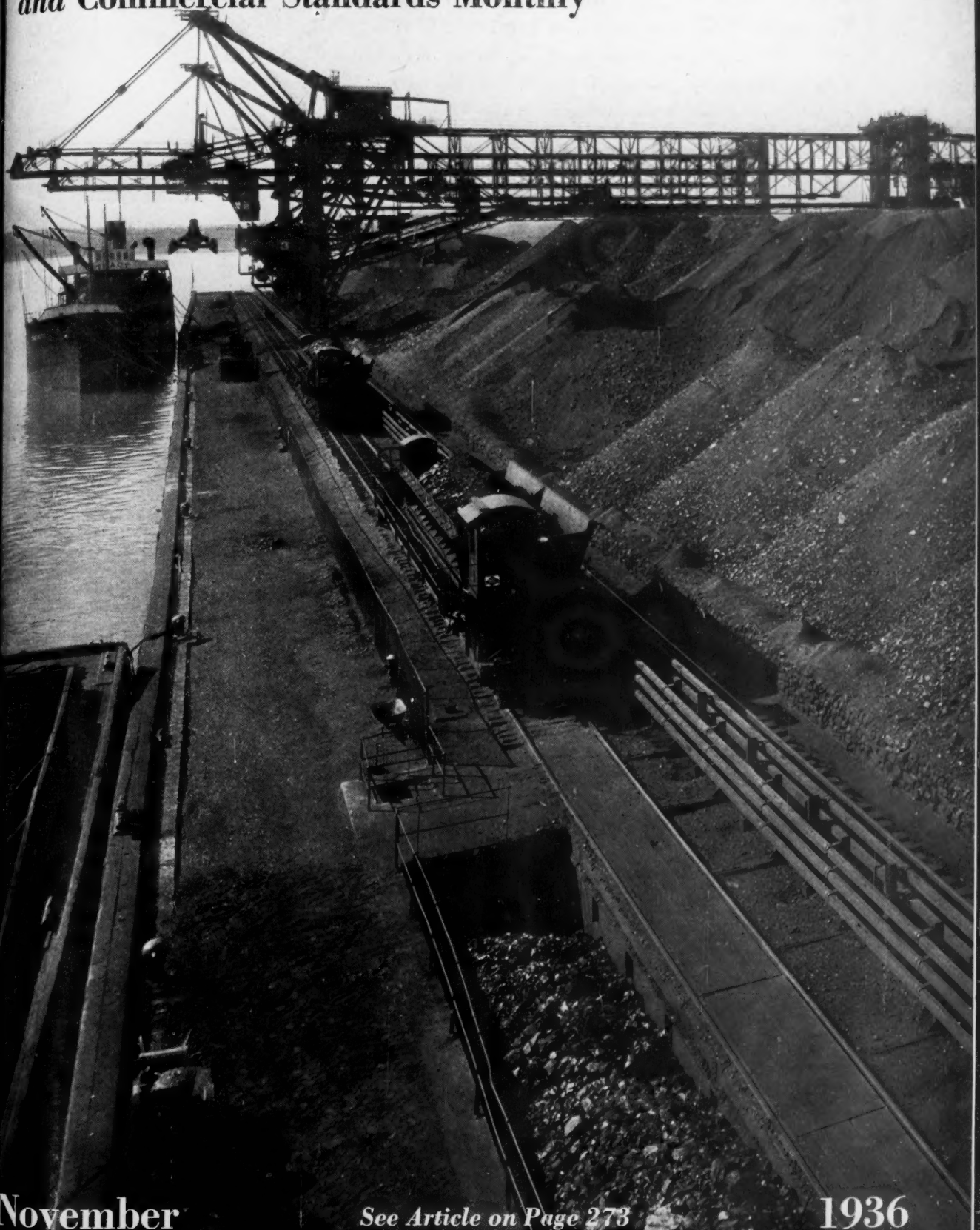
Industrial Standardization

and Commercial Standards Monthly



November

See Article on Page 273

1936

This Issue: ***Front Cover—Courtesy Consolidated-Edison Co. of N. Y.***

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NOVEMBER 1936

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American Standard Sets Up Common Language for Coal

Classification Will Help Coordinate Research Reports, Decide Legal Questions, Prepare Purchase Specifications

Committee Asks Industry's Comment

by

A. C. Fieldner[1]

Chairman, Sectional Committee on the Classification of Coal

APPROVAL by the Standards Council of the American Standards Association of the tentative standards for the Classification of Coals by Rank and by Grade[2] marks the completion of a major step in providing a universal language for describing American coals.

This project, started in 1927, enlisted the services of the leading scientists and engineers of the United States and Canada who were conversant with the occurrence and nature of coal and with its mining, preparation, and utilization. Governmental, educational, and industrial laboratories participated in the research and fact-finding program on which the classification is based; and the studies made and published have greatly enriched

[1]Chief, Technologic Branch, U. S. Bureau of Mines, Washington, D. C.; President, American Society for Testing Materials.

[2]M20.1-1936 (ASTM D388-36T) and M20.2-1936 (ASTM D389-34T), submitted by the sponsor, the American Society for Testing Materials.

Our Front Cover

How one large user unloads and stores his coal supply. The mechanical unloading and storing equipment takes coal from steamers at the rate of nearly 1,000 tons an hour.

The two new American Standards for Classification of Coals will be important tools in determining the burning quality of the coal ordered.

The picture was furnished through the courtesy of the Consolidated-Edison Company of New York.

our meager knowledge of the properties of North American coals.

The combined coal reserves of the United States and Canada, embracing two-thirds of the world's known supply, contain practically every rank of coal ranging from peat to anthracite and also the less usual types of coal such as cannel, splint, and boghead. The problem, therefore, was unusually difficult and the seemingly simple scheme of classification finally devised is no indication of the enormous amount of work done in developing the specifications that were presented to the American Standards Association.

It is the purpose of this article to review briefly the work of the committee, to interpret the standards adopted, and to indicate, to some degree, their scientific and industrial application.

Demand for Standard Classification

The first step in the effective use of any material is the accumulation of knowledge concerning its properties and composition. The second step is the reduction of this unorganized knowledge to a science by proper classification.

Gaseous fuels are homogeneous mixtures of simple chemical compounds which can be identified and their relative proportions determined. Liquid fuels likewise are homogeneous fluids in which the chemical family groups, at least, can be recognized and determined. Gaseous and liquid fuels are, therefore, readily classified on the basis of composition and simple physical properties.

Solid fuels, on the other hand, are heterogeneous mixtures. Coal, in particular, is a conglomerate of substances which vary in origin, constitution and composition. This diversity is responsible for the different properties of various kinds of coals. One coal, on heating in a retort, will melt and form coke, whereas another merely will char; one coal gives off large quantities of gas and smoke, while another burns smokelessly and yields but little gas.

It was known in a general way that these properties were related to the chemical composition of the coal, but the precise relationship was not known—certainly not well enough for definite classification.

The problem of coal classification, therefore, was much more difficult than the classification of gas or oil and much research was required to bring some degree of order out of the large accumulation of uncoordinated empirical facts relating to the properties and composition of American coals.

According to Thom,[3] "The developing need for a coal classification was first indicated by the employment prior to 1300 of such terms as bitumen lapideum, cannel coal, Braunkohle, lignite, anthracite, etc., and by the subsequent adoption of the terms semibituminous, semianthracite, and subbituminous coal."

In 1837 Regnault proposed a scheme of coal classification based on the hydrogen, carbon, and oxygen content of coal as shown by ultimate analyses. This system, subsequently modified and amplified by Gruner and Bousquet[4] in France,

[3]Thom, Jr., W. T., Status of Scientific Classification of American Coals. Trans. Am. Inst. Min. and Met. Eng., Coal Division, vol. 101, 1932, p 202.

[4]Gruner, E., and Bousquet, G. Atlas Generale des Houilleres. 11e Comite des Houilleres de France, Paris, 1911, p 16.

Mechanical coal cutting equipment has largely replaced hand mining in recent years

Courtesy Pittsburgh Coal Co.

and by Seyler[5] in Wales and by many others, is used in one form or another in most European countries.

In America, the simpler proximate analysis, especially the ratio of volatile matter to fixed carbon (known as the "fuel ratio"), has been preferred to the ultimate analysis for the classification of coal according to rank in the scale of metamorphism from peat to anthracite.

This method of classification, first proposed by Prof. W. R. Johnson in 1844, was used in 1879 by Frazer of the Pennsylvania Geological Survey, and in 1917 by Campbell of the U. S. Geological Survey in defining anthracite, semi-anthracite, semi-bituminous, and bituminous coals. However, the "fuel ratio" failed to give a satisfactory differentiation between low-rank bituminous, subbituminous, and lignitic coals, and Campbell was obliged to use other factors such as moisture and weathering properties for these coals.

To meet this difficulty, Prof. S. W. Parr in 1922 proposed another system also based on the proximate analysis, but using the per cent volatile matter and the calorific value (Btu) of the dry coal calculated to a mineral-matter-free basis by a special formula; and in 1926, Geo. W. Ashley of the Pennsylvania Geological Survey proposed another modification in which coals are classified according to their percentage fixed carbon on the ash-free basis but containing their normal moisture content as occurring in the coal-bed. This situation of three different systems for classifying American coals, each proposed by competent authorities, led to the formation in 1927, of the Sectional Committee on the Classification of Coals sponsored by the American Society for Testing Materials and operating under the rules of the American Standards Association.

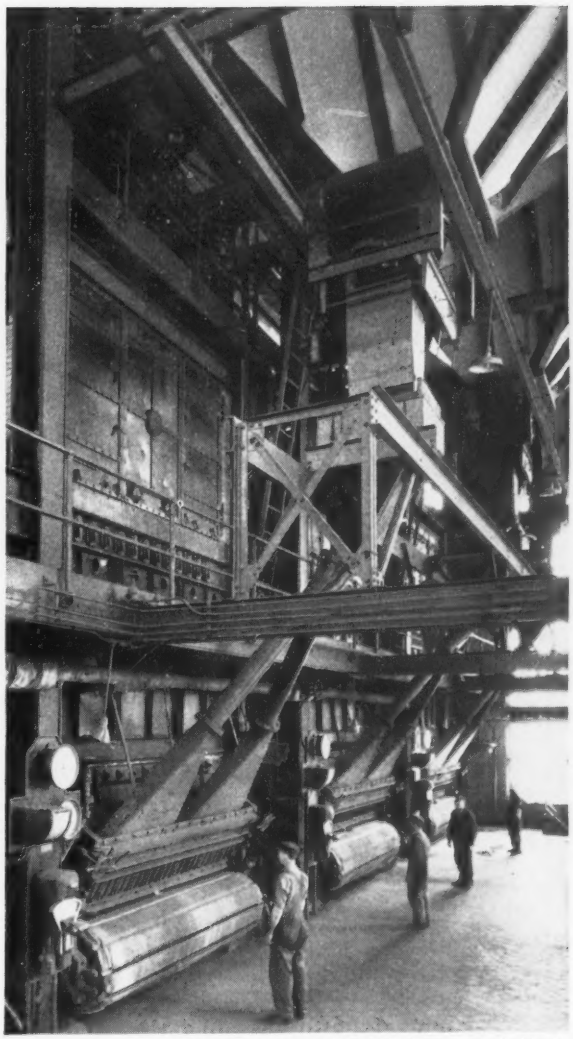
Objectives and Organization of Committee

The outstanding problem that faced the committee was how to reconcile the different points of view of the scientific, engineering, and commercial groups in working toward the common goal of a uniform and adequate system of classification. The scientist naturally classifies on the basis of his particular type of knowledge; for example, the chemist on the basis of chemical composition, the paleobotanist on the types of plant remains in the coal, and the geologist on the degree of metamorphism of the coal produced by geological action and the relation of the coal bed to other strata of the earth's crust.

The user of coal also classifies according to his particular experience and the special qualities that best serve his purpose, such as combustion characteristics for steam generation, carbonizing properties for gas and coke manufacture, and other factors peculiar to the individual use of the coal.

In addition to these classifications are the endless trade designations as to size, appearance, coal bed, geographical location, etc.

At first sight it seemed a hopeless task to develop an orderly plan of classification that would prove useful to the many different interests involved. However, closer view of the situation disclosed two basic principles at the bottom of all the methods: First, the intrinsic physical and



Courtesy Consolidated-Edison Co. of N. Y.

Mechanical stokers handle the coal in firing these boilers, which daily convert more than 1,400,000 pounds of water into steam

[5]Seyler, C. A. The Chemical Classification of Coal. Proc. S. Wales Inst. Eng., Pt. I, vol. 21, 1899, p 483, et seq.

chemical properties of the coal due to its origin, constitution, and degree of metamorphism; and second, the purposes for which the coal can be used to good advantage.

Large Committee Prepares Coal Classification

A committee representing varied interests concerned with the mining, sale, and use of coal was responsible for development of the new coal classification. The committee is under the administrative leadership of the American Society for Testing Materials.

Members of the committee are:

Dr. A. C. Fieldner*, American Society for Testing Materials, *Chairman

H. J. Rose*, American Institute of Mining and Metallurgical Engineers, *Vice-Chairman

J. D. Battle*, National Coal Association, *Secretary

American Society for Testing Materials, *Dr. A. C. Fieldner*
American Ceramic Society, *W. H. Fulweiler*
American Chemical Society, *H. H. Lowry*
American Gas Association, *W. Cullen Morris*
American Institute of Mining and Metallurgical Engineers, *Harold J. Rose*
American Mining Congress, *Warren R. Roberts, G. B. Southward (alt.)*
American Society of Mechanical Engineers, *F. R. Wadleigh*
American Transit Association, *H. A. Kidder, Arthur E. Ellis (alt.)*
American Wholesale Coal Association, *E. H. Zimmerman*
Anthracite Institute, *E. W. Parker, R. H. Buchanan (alt.)*
Association of State Geologists, *Geo. H. Ashley, Harold E. Culver, F. H. Reed, G. H. Cady (alt.)*
Coal Mining Institute of America, *W. R. Chedsey*
Electric Light and Power Group, *S. B. Flagg, Alexander Maxwell (alt.)*
International Railway Fuel Association, *Malcolm Macfarlane*
National Association of Purchasing Agents, *T. W. Harris, Jr.*
National Coal Association, *H. N. Eavenson, H. M. Ferguson*
National Research Council, *Taisia Stadnichenko*
National Retail Coal Merchants Association, *Chas. B. Johnson*
Southern Ohio Pig Iron and Coke Association, *D. J. Demorest*
U. S. Department of Interior, Bureau of Mines, *John F. Barkley*
U. S. Department of Interior, Geological Survey, *T. A. Hendricks*
Members-at-Large, *Dr. S. P. Burke, R. E. Gilmore, Dean E. A. Holbrook, Charles O'Neill*

The first principle is scientific and fundamental. The second is not, because the uses of coal are subject to change with new developments, and vary somewhat according to available supply and economic conditions. Nevertheless, the second principle may prove useful in formulating a secondary classification of practical value, especially if correlated with a scientific system.

The sectional committee therefore organized two technical committees to work along the lines of these two principles. One was a committee on scientific classification to formulate a system based on the intrinsic properties of the coal; *i.e.*, on its chemical and physical properties, constitution and origin. The other was a committee on use classification to make a study of the possibilities of developing a system based principally on the uses of coal and commercial practice, but correlated with the scientific system as far as practicable. These two technical committees, together with one on marketing practice and another on nomenclature, conducted a comprehensive program of research and fact-finding over a period of six years which culminated in practically unanimous agreement on specifications for the classification of coals by rank and by grade. These were adopted as tentative by the American Society for Testing Materials in 1934.[6] Publication and trial of these specifications indicated only minor modifications which were made before submitting them for approval to the American Standards Association in 1936.

Essential Features of Classification System Recommended

The classification system devised by the sectional committee is in reality a combination of the Parr, Campbell, and Ashley methods and

[6]See following publications for progress and summary reports dealing with the work of the Sectional Committee:

Annual Reports of the Sectional Committee on Classification of Coals. Proc. Am. Soc. Test. Mat., Pt. I: 1929, pp 396-404; 1930, pp 812-6; 1931, pp 489-501; 1932, pp 439-45; 1933, pp 357-9; 1934, pp 463-80; 1935, pp 357-60; 1936, in press.

Fieldner, A. C., The Classification of North American Coals. Proc. 2d. Int. Conf. Bit. Coal, vol. 1, 1928, pp 632-61.

Fieldner, A. C., Coal Classification is Boon to Industry. Industrial Standardization, vol. 5, 1934, pp 63-8.

Rose, H. J., Coal Classification. Ind. Eng. Chem., vol. 26, 1934, pp 140-3.

Selvig, W. A., Ode, W. H., and Fieldner, A. C., Classification of Coals of the United States According to Fixed Carbon and Btu Am. Inst. Min. and Met. Eng. Tech. Pub. 527 (1934); also Trans. Am. Inst. Min. and Met. Eng., Coal Division, vol. 108, 1934, pp 188-97.

Rose, H. J., Progress in the Classification of Coals of the United States. Proc. 3d Int. Conf. Bit. Coal, Carnegie Inst. Tech., vol. II, 1931, p 838.

Thom, Jr., W. T., Status of Scientific Classification of American Coals. Trans. Am. Inst. Min. and Met. Eng., Coal Division, vol 101, 1932, pp 201-14.

therefore does not introduce a radically different nomenclature or grouping of coals than heretofore used by American scientists and engineers. It is in accord with the requirements laid down by Grout[7] who stated: "All bases (for a scientific classification) should be capable of quantitative determination, or be exactly related to some property capable of such a test, so that, if no natural groups are found, arbitrary lines may be drawn to limit the classes.

"The best basis for classification should involve inherent and fundamental qualities of the materials considered. Allied to this is the requirement that advantage should be taken of any natural grouping. As a further help in selection, the bases or tests should be easily applied, widely known, and have a wide range of values in the material classified."

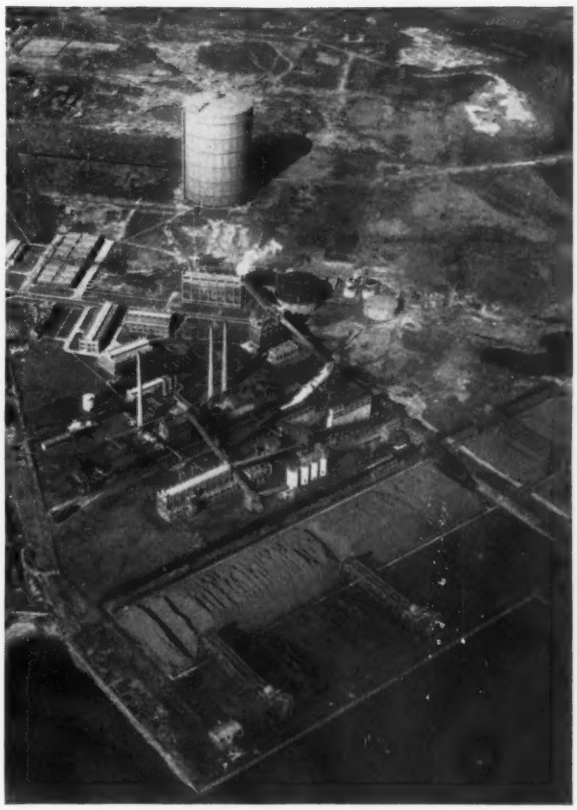
Classification is made along three different lines:

1. By rank, or according to the degree of metamorphism or progressive alteration in the natural geological processes as manifested from lignite to anthracite.
2. By grade, or according to the nature and amount of impurities in the coal, size of lumps, etc.
3. By type, or varieties conditioned principally by the ingredient vegetable material, such as common bright coal, splint, cannel, and boghead or algal coal. (The specifications for type classification are in process of formulation.)

The specifications for the boundary lines of the different classes are based on simple chemical and physical tests, most of which are made in the ordinary commercial coal analysis.

In classification by rank the high-rank coals, ranging from low-moisture high-volatile bituminous coal to anthracite, are classified according to their percentage of dry-mineral-matter-free fixed carbon; and the low-rank or high moisture coals and lignite according to their moist-mineral-matter-free calorific value (Btu). Moist means that the coal contains its natural bed moisture but is free from visible surface moisture. Agglomerating and weathering indices are used as auxiliary tests to differentiate between certain adjacent groups.

Copies of the standards (Classification of Coals by Rank M20.1-1936, A.S.T.M. D388-36T, and by Grade M20.2-1936, A.S.T.M. D389-34T) are available from the American Standards Association at 25 cents each.



The Hunts Point Gas Manufacturing Plant, Consolidated-Edison Co. of New York—Coal, stored by the thousands of tons, is here ready to be used in the manufacture of gas

Scientific and Industrial Use of Classification Standards

The scientific and industrial value of coal classification is obvious. By agreement of all concerned it provides a division of coals into 13

[7] Grout, F. F., The Classification of Geological Materials and the Classification of Coal. Economic Geology, vol. 4, 1909, pp 646-658.

Charts Classify Coal by Rank

Charts which show graphically the classification by rank of typical coals of the United States, with descriptions of the coals studied, are published in *Classification Chart of Typical Coals of the United States*, Bureau of Mines Report of Investigations No. 3296. This report may be obtained from the U. S. Bureau of Mines, Washington, D. C.

different groups whose boundary lines can be definitely determined by the application of simple physical and chemical tests. The coals in each group have some degree of similarity in properties of major importance although they are by no means identical in all respects.

Governmental and commercial organizations will use this grouping in classifying and in collecting statistics relating to American coals. Scientists and engineers will welcome these standards in reporting the results of research and tests and they will lead to better correlation of the work of various investigators. Disputes and costly litigation with respect to transportation rates and import duties will be eliminated by the provision of authoritative definitions of different classes of coal.

The National Bituminous Coal Commission already has made use of these standards in making a decision with respect to certain coals on the borderline between anthracite and bituminous coal; and the coal industry, itself, has begun to use the rank and grade specifications as a framework on which to erect more detailed classification for regional marketing practice.

Experience will indicate further developments, especially in classifying coals by grade. Large industrial consumers will be the first to make use of the specifications in buying coal for specific purposes such as the manufacture of coke and gas, pulverized fuel furnaces, situations requiring smokeless or semi-smokeless fuels, long or short flame fuels, low-ash fuels, etc.

The domestic consumer with no means for testing at his command is not in position to determine whether his coal comes within the specifications of a given class in all respects.

A word of warning also must be given to those who expect too much from these standards. Coal is an extremely variable material. Like people, no two coals are identical in all their characteristics. We can classify people as white and black, tall and short, English and German, and so on; but no possible classification will fit all their individual characteristics. So it is with coal. We must make allowance for considerable variation in coals of the same rank and grade. Nevertheless, classification simplifies our problem in dealing with the infinite variation in the properties of our American coals.

Future Work of the Committee

At the present time the committee is dealing with the difficult problem of defining coal according to type; *i.e.*, according to the nature of the plant materials that contributed to the coal bed and the conditions that prevailed during the peat stage of coal formation. Such a classification is primarily of scientific interest but it also has a commercial application in differentiating cannel, splint, and boghead coal from the common bright coals which comprise by far the bulk of our coals.

Charts to Help Consumers

The committee also is working on the correlation of scientific and use classification and is preparing a series of charts of "Factors Recommended for Consideration in the Selection of Coal."[8] These charts should be useful to consumers in indicating which chemical and physical factors should receive consideration when selecting coals for specific uses.

Another new proposal of the committee is a "Method for Designating the Size of Coal from its Screen Analysis." It provides a convenient and condensed method for describing the size of coal from screen test results, based on upper and lower limiting screens which result in designated percentages of oversize and undersize. This method was adopted as tentative in connection with the use classification of coal by the American Society for Testing Materials at its 1936 annual meeting.

Since all of these specifications and methods are tentative, the committee is anxious to receive constructive criticisms and suggestions for further improvement before recommending advancement from tentative to standard. These should be sent to A. C. Fieldner, Chief, Technologic Branch, U. S. Bureau of Mines, Washington, D. C., chairman, or to J. D. Battle, secretary.

[8] A preliminary discussion of these charts was published in INDUSTRIAL STANDARDIZATION, July, 1936, p 175, and in the *Philadelphia Purchasor*, June.

ASA Committee Gives All Interests Equal Voice

To give all organizations concerned with problems of coal standards a chance to meet on an equal footing in solving these problems, the Sectional Committee on Classification of Coals was organized in 1927 under the procedure of the American Standards Association. Administrative direction of the committee's activities was assigned to the American Society for Testing Materials.

The A.S.T.M., through its Committee D-5 on Coal and Coke, has been engaged for many years in the development of methods of sampling, analyzing, and testing these materials, as well as of

specifications affecting marketing of foundry coke and coking coals.

Close cooperation between the sectional committee and A.S.T.M. Committee D-5 has been maintained in all of the work leading up to the development of the American Tentative Standards for classification of coals. Problems of mutual interest were studied cooperatively and overlapping of work was avoided through careful coordination of the programs of subcommittees of the sectional committee and A.S.T.M. Committee D-5.

Other standards of interest to those concerned with coal problems have been approved by the American Standards Association as follows:

Methods of Laboratory Sampling and Analysis of Coal and Coke (K18-1933; A.S.T.M. D 271-33)
Test for Cubic Foot Weight of Crushed Bituminous Coal (K20.1-1936; A.S.T.M. D 291-29)
Test for Cubic Foot Weight of Coke (K20.2-1936; A.S.T.M D 292-29)
Tumbler Test for Coke (K20.3-1936; A.S.T.M. D 294-39)
Shatter Test for Coke (K20.4-1936; A.S.T.M. D 141-23)
Test for Volume of Cell Space of Lump Coke (K20.5-1936; A.S.T.M. D 167-24)
Method of Sampling Coal (X1-1921; A.S.T.M. D 21-16)

These are all available from the American Standards Association at 25 cents.

They are also included in the compilation of all standards and tentative standards, both specifications and methods of test, for coal and coke published by the American Society for Testing Materials. This pamphlet includes standard and tentative specifications and methods of test for coal and coke, and also standard definitions of terms relating to coke.

The publication also includes 1936 reports of the Sectional Committee on Classification of Coals, together with the two recently approved American Standards for Classification of Coals, and the report of A.S.T.M. Committee D-5 on Coal and Coke.

ASA Foreign Standards File Gives Company Unique Service

A large New York corporation needed information about standards in other countries. Their files showed some data but were not complete. Inquiry at consular services of the countries involved resulted in a visit to the American Standards Association, the only place in the United States where up-to-date information can be obtained about foreign standards.

A complete check of the ASA file of foreign standards by a member of the staff of the corporation with the ASA librarian gave this corporation the up-to-date record it needed.

New Jersey Lacks Codes, Building Survey Shows

Studies by government and quasi-public agencies, recently, have clearly shown that few municipalities have building codes which have been developed within the last few years.

The status of building codes in New Jersey was emphasized by a recent report from the New Jersey State Planning Board. Of the 564 municipalities in the state only 180 have adopted building codes. Although there is no state-wide building law establishing minimum requirements, there are some state laws setting up requirements for specific kinds of buildings, such as theaters, assembly halls, etc. New Jersey also has definite provisions establishing minimum standards for tenement houses and the New Jersey state department of labor has jurisdiction over factory-building inspection.

Less than 10 per cent of the 180 building codes in New Jersey are less than five years old, while 40 per cent of the municipalities are using building codes adopted more than 11 years ago.

Activities of the Building Code Correlating Committee of the American Standards Association have been brought to the attention of New Jersey municipalities as well as those of other states through the facilities of the American Municipal Association. This organization, a federation of state leagues of municipalities, is directly representing the municipalities on the Building Code Correlating Committee.

In August, the American Municipal Association distributed a statement calling the attention of the municipal governments to the work of the BCCC and emphasized the value this work will be, as it develops, to the governments of towns and cities.

Requests for assistance and information on building codes and the work under ASA have been received from several cities and states, including New Jersey.

Recommend Sizes for Coarse Aggregates

Printed copies of the Simplified Practice Recommendation R163-36, Coarse Aggregates (Crushed Stone, Gravel, and Slag) are now available, according to an announcement from the Division of Simplified Practice, National Bureau of Standards. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

The recommendation consists of two tables designated as Group A and Group B sizes of coarse aggregates. Each table gives size number, nominal size of square openings of sieves, and the amounts finer than each sieve (square openings), per cent by weight, for primary, and combined and modified sizes. Two tables showing typical uses for Group A and Group B sizes, and a table showing approximately equivalent round and square opening testing screens are included.

The recommendation was proposed by the Joint Technical Committee of the Mineral Aggregates Associations, which includes representatives of the three leading associations of producers of mineral aggregates.

A statement about the development of the recommendation, prepared by the Joint Technical Committee, was published in INDUSTRIAL STANDARDIZATION, March, page 68.

Shrinkage Test Issued As Separate Standard

The standard methods of test for shrinkage of woven cotton cloth, heretofore included in the general standard methods of testing woven textile fabrics, have now been approved as a separate standard and will soon be published as such.

The shrinkage test is used by cloth and garment manufacturers, by distributors and consuming agencies, as a means of determining shrinkage of woven cotton cloth. It is applicable to tests on both gray cotton goods and the finished fabric. When the methods outlined in this laboratory test are well controlled, the results obtained can be reasonably accurately reproduced by different analyses in different laboratories. It was developed jointly by the National Bureau of Standards, the American Association of Textile Chemists and Colorists, and the American Society for Testing Materials Committee D-13.

Recent consideration indicated that it would be desirable to have the shrinkage test a separate standard because it applies to woven cotton cloth only, whereas the general standard methods are intended to be suitable for all woven fabrics.

Copies of the Standard Method of Test for Shrinkage in Laundering of Woven Cotton Cloth (L10-1936; A.S.T.M. D437-36) are available from the American Standards Association at 25 cents each. ASA Members are entitled to 20 per cent discount on all approved American Standards.

Fabrics Tests Changed In Revised Standard

A revised standard, making minor changes in the general methods of testing woven textile fabrics, has been approved by the American Standards Association. The changes, which are mostly of an editorial nature, include a few revisions in substance to bring the procedure into line with current practice.

The new standard does not include the method of test for shrinkage, which has been approved as a separate standard.

The American Society for Testing Materials, sponsor for the standard, submitted the revisions to the ASA for approval.

Copies of the American Standard General Methods of Testing Woven Textile Fabrics (L5-1936; A.S.T.M. D39-36) will soon be available from the ASA at 25 cents each. Members of the American Standards Association are entitled to 20 per cent discount when ordering standards.

International Uniformity For 15 Auto Projects

Fifteen recommendations for international uniformity in automotive practice have been developed by Technical Committee 22 of the International Standards Association. They have been assented to by the national standardizing bodies of 16 countries and published in ISA Bulletin 10.

The automotive recommendations are for: speedometer and tachometer drive with finger, size of holes for instruments (tachometers, pressure gages, clocks, etc.), oval carburetor flanges, course for opening for carburetors and governors, 14 mm and 18 mm spark plugs, mounting of bumpers for private cars, screwed radiator and tank caps, position of pedals, mounting of distributors, mounting of headlights, terminals for batteries, movement of gear-shift levers, direction of rotation of instruments and machines, diameter of steering wheels, and gear-shift lever screwed handles.

Confusion Turns to Order—

Standard Unifies Terminal Markings

by

L. F. Adams[1]

Chairman, Sectional Committee on Terminal Markings for Electrical Apparatus

WHICH do you prefer—an electrical machine with a number of unidentified leads sticking out of it or one that has all leads marked; and further, marked according to an American Standard?

The answer is obvious. The new standard, Rotation, Connections, and Terminal Markings for Electric Power Apparatus, approved as an American Standard by the American Standards Association, on June 12th, 1936, contains the information for marking the terminals for direct-current motors and generators, induction motors, alternating-current generators and synchronous motors, synchronous converters, and constant potential transformers. It will aid in making connections to other parts of the electric power system and tends to avoid improper connections which may result in unsatisfactory operation or damage.

It is probable that it was found desirable to mark the terminals of electrical machines soon after they came into use, although my records do not go back that far. We do know that some manufacturers had established a system of terminal markings by 1892, and if at that time the manufacturers had gotten together and established one system which all could use, it would have saved headaches for many of us.

But that was not possible in those days, probably not even thought about. So, we come along to, say, 1912 and stop to look at the confusion caused by this lack of standardization. No two manufacturers used the same terminal markings; and moreover, the terminal markings established

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Revision, Approved by American Standards Association, Applies Markings to Indefinite Number of Terminals on Any Motor

New Section on Industrial Control Apparatus and New Markings for Farm Lighting Plants and Single-Phase Motors Now Included

[1]General Electric Company, Schenectady, N. Y.

by a single manufacturer were not correlated within his own company. As an example, we find a customer purchased a two-speed induction motor with a pole-changing switch, an auto-transformer motor starter, and an oil-circuit breaker, four pieces in all. Each piece had its leads or terminal marked so it should be easy to make the electrical connections between them and to the source of supply. Furthermore, with each piece of apparatus there was a diagram of connections.

Markings Differ

The motor diagram showed how to connect the motor leads to get the different speeds, and employed the terminal markings corresponding to those on the motor terminal board. With the pole-changing switch there was another diagram showing the terminal markings of the switch and, in order to make the diagram complete, the connections to the two-speed motor were shown, but the terminal markings used for the motor terminals were picked out of thin air, for they were wholly different from those used on the motor.

Another diagram of connections accompanied the auto-transformer motor starter and the terminal markings for this device were shown corresponding to those marked on its terminals. Here again, it was felt that the diagram should show the rest of the apparatus, so a pole-changing switch and a motor were shown with terminal markings, but neither corresponded with the markings on the devices nor on the connection diagrams accompanying these respective devices.

And then the oil circuit breaker carried a connection print, with its corresponding terminal markings, and to make the diagram complete, an auto-transformer motor starter, a pole-changing switch, and a motor were shown. Here again, terminal markings were assigned to these different pieces of apparatus which were entirely different from the markings on the other three diagrams, and also different from the terminal markings stamped on the terminals of the respective pieces of apparatus.

An experienced man could readily connect the four pieces of apparatus, but occasionally one who was not so wise became confused with four diagrams, all carrying different terminal markings. Occasionally, a customer would take one look and telegraph for help.

About 1913 the manufacturers undertook the standardization of terminal markings so that cases like the foregoing would not occur. But they realized that, while they could remove such discrepancies from their own apparatus, the same discrepancies would exist if parts of the apparatus which must work together were purchased from different manufacturers. Therefore, in 1914 it was proposed to The Electric Power Club, an association of apparatus manufacturers, that it standardize the terminal markings of motors and generators. This was done, and the first standard issued in 1918 covered not only motors and generators, but transformers as well.

In arriving at these standards a special committee of The Electric Power Club made a very thorough study of the terminal markings in use by the different manufacturers, and of all schemes for terminal markings which had been proposed in different countries up to that time. Based on this study, a number of different plans were considered but it was recognized that whatever plan was adopted, it must cover all kinds of electrical apparatus and be sufficiently flexible to provide for any number of connections on any one piece of apparatus, and at the same time allow for its adaptation to types or kinds of apparatus which may be developed in the future.

Many of the plans proposed were admirably suited to the needs of one or two lines of apparatus, but failed when applied to all the different types in common use.

The system finally selected consists of assigning a characteristic letter to each class of connections and to differentiate between the various terminals of each class by the use of sub-numbers. For instance, the letter A always indicates a brush on a commutator, whether used for alternating current or direct current machines. Individual connections on the same diagram or machine are distinguished by marking them A_1, A_2, etc.

Under this plan only part of the alphabet has been used and enough remains to cover any absolutely new varieties of apparatus which are likely to be developed in the future. Only capital letters are used, which avoids any special precautions in dictating, typing, telegraphing, or oral instructions to guard against the wrong size letter.

ASA Project

During the year 1920 The Electric Power Club, now the National Electrical Manufacturers Association, expressed a desire to have its standards on terminal markings made an American Standard and in the latter part of that year the project was authorized by the American Standards Association, and The Electric Power Club was designated as sponsor. A sectional committee was formed and proceeded with its assignment under the following scope:

> **A system of connections and of markings for terminals for electrical equipment, including generators, motors, converters, transformers, and power control apparatus, together with the auxiliaries ordinarily furnished with such apparatus.**

After four years of diligent effort the first

standard for connections and marking of terminals was completed and approved by the ASA as an American Standard in April, 1925. The first section of this standard covered the fundamental scheme, and the other sections are illustrations of the proper manner of applying the fundamental scheme to some of the commonly used types of apparatus. The diagrams are not those usually sent out with the apparatus but are intended only for the use of engineers and draftsmen in correctly placing the required markings on the working diagrams of connections or wiring.

Conform to Practice

The letters indicating the various classes of terminals are chosen, whenever possible, to conform to long-established practice and thus avoid confusion in the minds of those who have to make practical use of the diagrams. Thus A had, for over thirty years, been generally used to distinguish an armature or brush connection; F had been commonly used for a shunt field connection; S for a series field connection, etc. The system agreed upon is clear cut, extremely flexible, and capable of indefinite extension. There is no danger of confusing the markings of different terminals on account of similarity of symbols, such as might occur, for instance, when small and large letters are used. It represents the combined efforts of a large number of engineers and had stood the test of several years of practical application on a large scale.

The recent revision of this standard has been under consideration for ten years. Shortly after the approval of the standards in 1925, it was apparent that the markings for induction motors were inadequate as they only covered motors with six leads. The present standard now covers a very comprehensive treatment of fundamentals whereby the terminal markings may be determined for any number of leads brought out of the motor.

There is a definition for phase sequence and changes have been made in the first section to introduce this term and avoid confusion when the word "rotation" is used alone, because when so used it may refer to either shaft rotation or phase rotation.

New standard terminal markings for farm lighting plants and single phase motors have been added. Some new diagrams for transformers are also included, making this section of the standard very complete. For the first time, some standard markings for Industrial Control Apparatus are given. While this standard covers both ac and dc motors, the railway types of motors are not included.

The example given above is an actual case but it must not be inferred that all the terminal designations for the various pieces of apparatus involved have been standardized. The terminal markings which are now in the American Standard only partially cover the field and should be extended to include other apparatus such as circuit breakers, motor starters, switches, etc. When this has been accomplished diagrams will still be required for assemblies of apparatus but standardized markings will be employed rather than letters from the alphabet selected in arbitrary and haphazard fashion.

The revised standard, including these changes, has now been approved by the American Standards Association. The National Electrical Manufacturers Association has the administrative leadership for this work. The standard, Rotation, Connections, and Terminal Markings for Electric Power Apparatus (C6-1936) is now available at 90 cents.

Committee Represents Manufacturers, Users

The committee in charge of developing standard markings for terminals for electrical apparatus is under the administrative leadership of the National Electrical Manufacturers Association. Members of the committee represent the interests which apply and use these markings. They are:

American Institute of Electrical Engineers, *R. W. Owens, J. B. Taylor, R. R. Lawrence*
American Transit Association, *C. R. Harte, Dwight L. Smith*
Edison Electric Institute, *E. A. Hester, E. B. Shew, J. O'R. Coleman (alt.)*
National Bureau of Standards, *H. B. Brooks*
National Electrical Manufacturers Association, *G. H. Garcelon, L. F. Adams, F. W. Smith, F. T. Wheeler, J. A. Jackson (alt.), R. C. Sogge (alt.)*

Copies of the revised standard will soon be available at 90 cents each.

Lists All Active Simplified Practice Recommendations

A list of all of the Simplified Practice Recommendations now effective has been compiled by the Division of Simplified Practice, National Bureau of Standards. Copies may be obtained through the office of the American Standards Association or from the Division of Simplified Practice, Washington, D. C.

ASA Approves Revisions Of Tests for Petroleum

CHANGES in 14 American Standard methods of testing petroleum products and lubricants have been approved by the American Standards Association. These changes bring the standard test methods up-to-date with present practice developed since the original approval of the tests.

These standards are now under the direction of the recently reorganized Sectional Committee on Petroleum Products and Lubricants (Z11), under the administrative leadership of the American Society for Testing Materials.

The revised American Standards are:

Abridged Volume Correction Table for Petroleum Oils (Z11.1-1936; A.S.T.M. D206-36)
Viscosity of Petroleum Products and Lubricants (Z11.2-1936; A.S.T.M. D88-36)
Flash Point by Means of Pensky-Martens Closed Tester (Z11.7-1936; A.S.T.M. D93-36)
Steam Emulsion of Lubricating Oils (Z11.15-1936; A.S.T.M. D157-36)
Burning Quality of Kerosene Oils (Z11.17-1936; A.S.T.M. D187-36)
Burning Quality of Long-Time Burning Oil for Railway Use (Z11.19-1936; A.S.T.M. D219-36)
Saponification Number (Z11.20-1936; A.S.T.M. D94-36)
Flash Point of Volatile Flammable Liquids (Z11.24-1936; A.S.T.M. D 56-36)
Carbon Residue of Petroleum Products (Z11.25-1936; A.S.T.M. D189-36)
Gravity of Petroleum and Petroleum Products by Means of the Hydrometer (Z11.31-1936; A.S.T.M. D287-36)
Distillation of Crude Petroleum (Z11.32-1936; A.S.T.M. D285-36)

The American Tentative Standard for Gum Content of Gasoline (Z11.36-1936; A.S.T.M. D 381-36) was advanced to the status of American Standard, in line with the same change of status in the American Society for Testing Materials.

The following American Tentative Standards were revised:

Tentative Definitions of Terms Relating to Petroleum (Z11.28-1936; A.S.T.M. D288-36T)
Knock Characteristics of Motor Fuels (Z11.37-1936; A.S.T.M. D357-36T)

Recommendations on these revisions were prepared by Committee D-2 of the American Society for Testing Materials and were considered and acted upon favorably by the Sectional Committee on Petroleum Products and Lubricants (Z11) which was reorganized during the past year with a broadened scope to include specifications as well as methods of test and nomenclature for petroleum products.

Separate copies of these standards are available from the American Standards Association at 25 cents each.

A more convenient form in which these standards may be obtained is the 1936 Report of Committee D-2 on Petroleum Products and Lubricants and Methods Relating to Petroleum Products. This book is available from the American Standards Association or from the American Society for Testing Materials, 260 S. Broad Street, Philadelphia, Pa., at $2.00.

This report is a compilation of all standards developed by Committee D-2. Included are related methods for testing bituminous materials and electrical insulating oils. It also includes a summary of activities of Committee D-2 and its associated subcommittees and technical committees. In its 372 pages, the text of 63 standards and tentative standards is given.

Research to Standardize Colors of Auto Cloth

The need for research to determine means of securing more uniform shades for automobile trim cloth brought about a joint meeting of the automotive industry, represented by the Society of Automotive Engineers, and members of the National Association of Wool Manufacturers and the Textile Foundation, in New York, September 17. This meeting grew from a start made by the late Roy Chapin, who first suggested such a study to the SAE Research Committee and the Textile Foundation. A portion of the group attending is pictured above.

Both industries agree that the unevenness of color in fabric supplied to the automotive industry causes great waste to both industries, and that the problem can be solved only through intensive research. A committee of three men, V. P. Rumely, Hudson Motor Car Co., representing the automotive industry through the SAE; Arthur Besse, president, National Association of Wool Manufacturers, and Franklin W. Hobbs, chairman of the Textile Foundation, was appointed to investigate means of conducting the research.

When Are Old Buildings Unsafe?[1]

Study Shows Need for Standards; ASA Building Code Correlating Committee May Take Up Problem

by
George N. Thompson[2]

Chief, Building Codes Section
National Bureau of Standards

ONE of the subjects that will probably engage the attention of the Building Code Correlating Committee is how to deal with buildings that have become unsafe because of age or conditions of use. Certainly if any feature of a building code is justifiable, it is the provision for protecting building occupants and the public from the consequences of deterioration and neglect. The principle is well established that public authority can protect citizens in such cases. The course of action varies to some extent in various jurisdictions but the underlying principles are the same.

The problem of how to get rid of old dilapidated buildings has always been difficult. It has become acute in recent years when the public has grown sensitive to frequent charges that municipal authorities are tolerating the existence of many substandard structures. Such structures undoubtely do exist in considerable numbers. When they are erected they met the standards of their time, but progressive deterioration and changing currents of city life have made them unfit for normal use today. In many instances they are actually unsafe. So the question is presented how municipal authorities can deal with them without causing injustice to their owners.

The buildings fall into several classes, depending on their physical condition.

There are those that are aesthetically repellent and shabby, harboring an undesirable class of tenants although in the main still sound structurally.

Courtesy New York City Housing Authority

This hallway of an abandoned building, condemned as dangerous and later destroyed, shows a particularly advanced stage of neglect

[1]Publication approved by the Director of the National Bureau of Standards of the U. S. Department of Commerce.

[2]Vice-Chairman, Building Code Correlating Committee, American Standards Association.

Old tenements before demolition by the New York City Housing Authority

There are those that are deficient in strength and fire resistance for their present occupancy but not sufficiently so to arouse any great degree of public indignation over their condition.

This house is typical of buildings condemned as dangerous by the Tenement House Department and demolished through the efforts of the New York City Housing Authority

There are those that have traveled well along the road toward complete physical degeneration, with sagging beams, leaning walls, rain-soaked ceilings, and other manifestations of deterioration and neglect.

Finally, there are those that are obviously dangerous to their occupants and to passers-by.

Need Replanning

All these structures are the victims of forces that operate silently but continuously in the direction of change.

The ravages of time are to be expected, but the tendency of cities to empty at their centers and increase in population at their peripheries has only recently been acknowledged. The consequence of this movement is to leave a large number of buildings, particularly dwellings, at the center without a use or useful only for some greatly different purpose than that for which they were originally designed. Replanning of whole areas with wholesale destruction of existing buildings appears to be the only remedy in such cases. This, however, is beyond the scope of our discussion which is concerned with measures that can be taken with single buildings.

The same site as that on page 286 after the condemned buildings had been destroyed and modern apartments built

Authority is present in most municipal building codes to deal with unsafe buildings, but the procedure is hedged about with so many restrictions that it has not been extensively employed. It has sometimes been supplemented by more informal measures as in the case of one southern city. Here, it is said, the building official strolling by some old shack remarks casually to a group of colored idlers that he doesn't like the looks of the building and would be glad to see it gone. Whereupon mysterious but discreet sounds are heard in the night and when dawn breaks no trace of the offending structure is to be found. Obviously, such a method has very definite limitations.

The legal authority bestowed on the local building officials is of two kinds, one consisting of summary action in emergencies where collapse is imminent and the situation obviously cannot wait for refinements of procedure. Here the official can step in, rope off the area, shore up or demolish the structure, or take any other action that appears justified under the circumstances. Of course, such situations are infrequent.

The other case involves a situation where a building is reported to be potentially dangerous and on inspection is found in fact to be so. If the circumstances appear to warrant it, the official can order the building vacated. He can call upon the owner to make suitable repairs or remove the structure. If the owner neglects to act, or refuses, the official can step in, arrange to have the necessary work done and send the bill to the owner, this bill thereupon becoming a lien upon the property.

The owner can avail himself of several steps to safeguard his interests. He can appear at a hearing and dispute the official's contention. Frequently there is provision for a board of survey which determines whether the building actually is in the condition that the official claims it is. On this board the owner may have representation. In all cases, of course, he has recourse to the courts if he is dissatisfied with the treatment accorded him.

Often the vacating of a building effects strong pressure on an owner even though he may succeed in delaying actual repairs. The loss of rents and in reputation of the building is a penalty in itself and an incentive to take prompt remedial measures.

Some recent building codes have gone beyond earlier practice in an apparent attempt to make action easier in border-line cases. For instance, the recently adopted code of Detroit has this to say:

> **Whenever a building shall become vacant and abandoned, and the doors and windows, or a substantial part of them, shall have been removed or opened, leaving the interior of the building exposed to the elements and accessible to entrance by trespassers, such building shall be deemed dangerous and unsafe.**

The building code of Denver, Colorado, also

ASA Committees Study Building Problems

The Building Code Correlating Committee, in charge of all building code work under the American Standards Association, has already organized committees to prepare standards on the following building problems:

Fire protection and fire resistance
Chimneys and Heating Appliances
Light and ventilation
Fire-extinguishing equipment

Other committees now being considered are an advisory committee on working stresses for building materials and a sectional committee on building code requirements for excavations and foundations.

Rudolph P. Miller, New York, is chairman of the BCCC, and George N. Thompson, Chief, Section on Building Codes, National Bureau of Standards, is secretary.

recently adopted, contains an extensive list of conditions deemed to make a building dangerous, including such items as defective flues, cracked foundations, crumbling plaster, and broken windows or doors admitting strong winds and rains.

These two codes cite physical conditions which are a considerable extension of the theory that structural integrity governs the determination of whether a building is dangerous or not. Their emphasis on general dilapidation and openness to the weather no doubt results from many experiences with structures where such conditions have been involved.

Serious Injury Possible

It is becoming generally admitted that to leave a building abandoned to inroads of adventurous children and vandals all too often results in serious personal injury. Numerous instances have been authenticated where children have been injured in buildings progressively weakened by pilfering of interior finish and structural members. Fires have been set in such buildings, endangering adjoining property. These structures also all too frequently provide havens for gambling and gang activities. Whether these conditions will be regarded by the courts as sufficiently serious to justify requiring demolition is more or less an open question.

Vigorous application of legal authority is said to have resulted in the elimination of over 1800 substandard housing units in Milwaukee in a period of six years. Here a general rule has been suggested that where the costs of repairs of dilapidated and unsanitary buildings exceed 50 per cent of the entire replacement cost of the building, exclusive of good masonry foundations, the buildings should be razed.

Voluntary Action Taken

Although enforced removal of old buildings has very definite legal limitations, voluntary action for the mutual benefit of the owner and the public has shown great promise. Persuasiveness rather than force is the essence of this procedure. The owner is in possession of an old, frequently abandoned, building which maintains an existence through inertia rather than for any real reason. It occurs to him, or is pointed out to him, that by demolishing the structure taxes and insurance will be saved and the possibility of damage suits from injured persons avoided. On investigation, it is found that a wrecking concern will remove the structure for little if any more compensation than the salvaged materials. So a step is taken from which every one benefits. This procedure has been accelerated since the availability of emergency relief labor which has been supplied in many cases to do the demolition work without cost to the owner.

Voluntary demolition of this kind has run into large figures. In Chicago alone over 3,000 buildings have been torn down in the last two and one-half years, the greater part through voluntary action. Other cities where substantial reductions in old buildings have taken place, partly as a result of legal action and partly by voluntary agreement, are Pittsburgh and New York.

In summary, the removal of substandard structures is accomplished in two ways, one through legal action instituted by the local official as a result of inspections made by him, the other through consent of the owner and arrangements to demolish at minimum expense to him. The possibilities of the latter method may become less promising as the worst of the old buildings are cleared away, leaving those of some income value to the owners. Some building codes are showing a stiffening in authority for the building official and a broader base for his action in requiring substantial repairs or complete demolition. This tendency is worth watching as an interesting attempt at extension of public control in the interest of safety. Earnest study will be required to deal effectively with the problem.

Twenty Years of Experiments To Give Data for Standards

COMPLETION of twenty years of testing the effect of atmospheric corrosion on samples of black iron and black steel sheets exposed at various locations throughout the country was celebrated by the American Society for Testing Materials in October. Results of the tests will be used in the development of standard specifications for metallic-coated materials.

Identical sets of test specimens were exposed to a variety of atmospheric conditions—the industrial atmosphere of Pittsburgh, the rural and light-industrial atmosphere of Fort Sheridan, Ill., and the sea-coast type of atmosphere at Annapolis, Md. About 485 specimens of two gages of sheets were exposed at each location.

Some of the samples contained added copper and a comparable number were non-copper-bearing or had low-copper content.

"The experiments demonstrated quite conclusively," reports the American Society for Testing Materials, "that steel sheets containing up to about two-tenths per cent copper offer a distinct increase to resistance to atmospheric corrosion as compared with sheets with little or no copper when they are both exposed freely to the atmosphere.

"As a result of information developed in these tests, various American industries have benefited greatly from the use of the so-called copper-bearing steel. For instance, in the railroad field the life of the plate parts of hopper cars in normal service has been increased four to five years by the use of copper-bearing steel instead of the ordinary steel.

Show Value of Phosphorus

"These atmospheric experiments have shown the value of phosphorus as an alloying element, although this observation has not been so widely circulated as was the information on copper. Phosphorus and copper together in steel produce more resistance to atmospheric corrosion than does copper alone.

"Not only did these experiments shed light on the efficacy of small additions of copper to steels, but they undoubtedly stimulated research into the use of higher percentages of copper as an alloying element. Within the past two years a number of so-called high-strength steels have been introduced in the market containing appreciable amounts of both copper and phosphorus."

Other important investigations on black iron and steel sheets are under way under the direction of A.S.T.M. committees. One series of tests involve the resistance to corrosion of black iron and steel sheets in running water in which 900 samples were exposed to filtered drinking water, brackish water, and acid-mine water. Six hundred specimens of sheets were tested in a program to determine the resistance to corrosion in seawater.

Five Test Sites

In another program 540 specimens of zinc-coated iron and steel sheets were exposed at five committee test sites to various types of atmosphere, and in an extensive test investigation begun in January, 1929, a total of 700 hardware specimens carrying commercial metal protective coatings of zinc applied by various processes—cadmium, aluminum, lead, etc.,—have been exposed at five test locations.

The latest test program—among the most extensive of those sponsored by the A.S.T.M.—includes atmospheric corrosion tests of wire and wire products. The specimens for these tests are now being assembled on the test racks.

"This Twentieth Anniversary of the outdoor exposure tests on sheets serves to emphasize that probably in no other way except through a program such as that sponsored by the Society does industry have access to facilities for conducting outdoor exposure tests over this long period of years with the same competent and unbiased supervision," says the report of the anniversary celebration in the *A.S.T.M. Bulletin*. "Through inspections and the publication of corrosion data in convenient form it is felt that the Society has made a distinct contribution to the field of useful engineering information relating to the performance of various metals."

Appliance Makers Name Rasch On ASA Standards Council

W. T. Rasch, president of the Association of Gas Appliance and Equipment Manufacturers, New York, has been appointed to represent the Association on the Standards Council of the American Standards Association. C. W. Berghorn, executive secretary of the Association, was appointed to act as alternate for Mr. Rasch.

The Association of Gas Appliance and Equipment Manufacturers recently joined the American Standards Association as a Member-Body.

New Device Standardizes Life-Saving Technique

Tells When Operator Is Using Correct Methods, Getting Best Results; Benefits First Aid Training

THE prone pressure method of artificial resuscitation is a highly standardized procedure, but until now no one could know definitely when the pressure was causing the proper amount of air to enter the lungs.

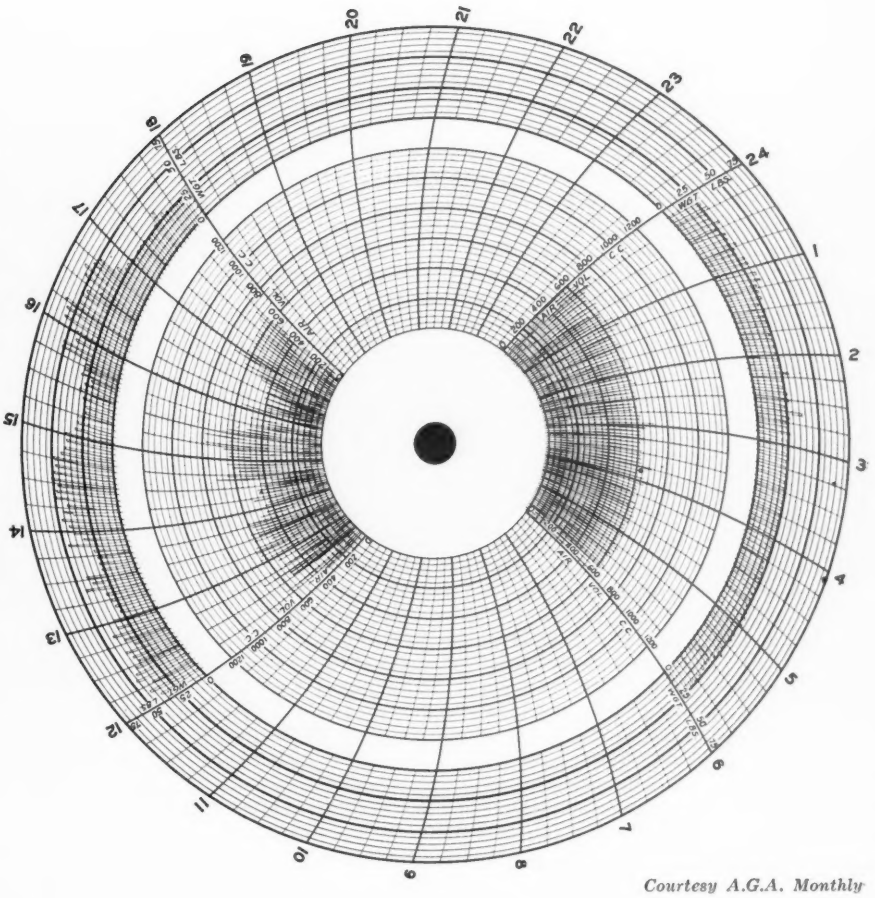
With the invention of a new device, which records the amount of air received by the lungs under pressure, persons being trained in the use of the prone pressure resuscitation method may check the results of their efforts and see when they are or are not bringing about the proper results.

The device records the weight pressure exerted on the subject, the air volume received, and the timing of the pressure simultaneously upon a single chart. The chart informs the operator continuously of the results he is achieving.

If the technique of the operator is wrong—for instance, if his hands are not in the proper posi-

Courtesy A.G.A. Monthly

C. I. Langdon (left), designer of the apparatus, explains to J. W. West, Jr., secretary, A.G.A. Accident Prevention Committee, how his device visibly records results of prone pressure method of resuscitation



This graph, made by the new device, shows (from 1 to 6) results of a perfect application of prone pressure resuscitation; (from 12 to 18) wide variance resulting from improper technique

Minutes, indicated on outside of chart, are broken up into 15-second segments. Outer group of circular lines shows weight pressure, each line 5 lb. Inner group of circular lines shows air volume, each line 40 cc of air.

Courtesy A.G.A. Monthly

tion, too close to the spine, too high on the ribs, too low down on the hips—the weight recorded is likely to be too heavy without forcing out a proper volume of air. This shows the operator that in some manner his technique is wrong. He can change his hands on his following cycles until he has found the proper spot by watching the results on his chart.

When the correct technique is applied, a definite volume of air, for instance, 500 cubic centimeters, can be produced on the average person with not more than 25 pounds' pressure. In other words, a minimum of pressure for the correct duration of time to get the desired volume of air is recorded when the technique is correct.

The device was designed and built by C. I. Langdon of the Lone Star Gas System Advertising Department, Dallas, Texas. It has been used by the Dallas police force to instruct policemen and to check their technique during first aid classes on artificial respiration.

"I've been working with prone pressure for 15 years," said an officer taking this Dallas police course, "but this is the first time I have ever really known what I was doing."

The Accident Prevention Committee of the American Gas Association reviewed the apparatus and reported that in the opinion of its members "the device constitutes a distinct contribution to better training of employees and others in the use of the prone pressure method of resuscitation."

Canadian Standards For Warming Pads

Specifications for electrically heated warming pads have been issued by the Canadian Engineering Standards Association and are now out for final comment before being printed.

Copies are available from the Canadian Engineering Standards Association, National Research Building, Ottawa, Ont.

Coal-Tar Creosote for the Preservation of Timber

B.S.S. No. 144. London, 1936: British Standards Institution.

"The chief alterations to the old specification are concerned with the methods of testing, in which personal equation in manipulation and apparatus has been reduced to the minimum by adopting the procedure of the Standardization of Tar Products Tests Committee. The specification includes three types of creosote, derived from the three main types of coal-tar, and the inclusion of creosote from blast-furnace tar is retained, while provision has now been made whereby those who wish to employ the oil from low-temperature tar will have a standard specification on which to base their practice. Footnotes have been added whereby the specific gravity ranges may easily be converted to the fundamental units of density—that is, grams per millilitre—at 38° C anticipating the hope that all British Standard Specifications for liquids in which specific gravity is given as a property will, in the course of time, show density figures instead." — *Mechanical World, London, Aug. 21.*

Ethelbert Stewart

Ethelbert Stewart, Commissioner of Labor Statistics from 1920 to 1932, and member of the ASA Standards Council from 1922 to 1932, died October 13 of a heart ailment. He was 79 years old.

Mr. Stewart became associated with the United States Bureau of Labor, which later became the Department of Labor, in 1887. In 1912 he became chief statistician for the Children's Bureau, and a year later was transferred to a similar position for the Bureau of Labor Statistics. He served in this post until 1918 when he was appointed a member of the Meat Commission. Shortly afterward he became a director of investigation and inspection service under the Department of Labor of the War Labor Emergency Administration. He was sent to England by the Department of Labor to organize an industrial conference in connection with the formation of the League of Nations in 1919. Three years later he was appointed United States Commissioner of Labor Statistics.

He was the representative of the Department of Labor at the convention of the International Institution of Statistics in Rome in 1925, and the American representative at the Fourth International Conference of Labor Statisticians in Geneva in 1931.

He retired in 1932 after a controversy with the Secretary of Labor, after a disagreement on unemployment figures. The dispute began when newspaper men who had a statement by the Secretary that employment was on the increase, consulted Mr. Stewart, who told them the figures he had compiled warranted no such announcement.

Mr. Stewart was a member of the National Safety Council, the National Research Council, secretary-treasurer of the International Association of Industrial Accident Boards, a fellow of the American Statistical Association, and a member of the Government Permanent Safety Council.

He was active for many years in the safety code program of the American Standards Association, as a member of the Safety Code Correlating Committee, and as a member of the Sectional Committee on Accident Statistics.

Standard Marking System For Valves and Fittings

The new edition of a Standard Marking System for Valves, Fittings, Flanges, and Unions of the Manufacturers Standardization Society of the Valve and Fittings Industry has now been published.

Eight rules for marking are applicable to specific lines of products in accordance with detailed schedules set up in Tables in section 3 of the standard. The scope, application, and general requirements are given in section 1.

The American Petroleum Institute cooperated in drafting the 1936 edition, and it was approved by the National Association of Purchasing Agents.

The American Petroleum Institute Committees which cooperated in drafting the new edition also approved it for submission to the American Standards Association.

The new MSS Standard Practice SP-25, Edition 1936, is available from the American Standards Association or from the Manufacturers Standardization Society of the Valve and Fittings Industry, 420 Lexington Avenue, New York.

Examines Need for Standards For Private Vehicle Carriers

An exhaustive inquiry to determine whether there is a need for fixing qualifications, maximum hours of service of drivers, and equipment standards in connections with vehicles used by private carriers transporting property, has been ordered by the Interstate Commerce Commission. The order for the investigation was dated July 30, under the provisions of the Motor Carrier Act of 1935.—*Highway Highlights, August 14.*

Need International Agreement for Petroleum Measurement, Says Argentinian Engineer

AN international agreement to bring about world-wide uniformity in measurement of liquid petroleum products was suggested by an Argentinian engineer, Hubert Platz, in a recent issue of the Argentinian *Boletin de Informaciones Petroleras.*

In the majority of countries producing petroleum (United States, British Empire, Mexico, Venezuela, Colombia, the Argentine, and others) the quantities are expressed in volume—in barrels, gallons, or cubic meters, according to Mr. Platz' article, although a few countries (Russia, Rumania, Germany, Poland, France, and Italy) indicate the volume by weight. This does not include tanker transportation, where the carrying capacity of the vessels is expressed in terms of weight. The confusion resulting from the use of units of weight on the one hand and non-metric units of volume on the other is made worse by the fact that the units of volume, although they have the same names, are of differing capacity. Both the American and English barrels are subdivided into gallons; the American gallon contains 3.785 litres, while the English (Imperial) gallon contains 4.546 litres.

Volume Measure Natural

"Expressing quantities in volume is the natural consequence of the exigencies of production and refining," Mr. Platz says. "Exploratory drilling having determined the volumetric extension of a deposit—as well as the degree of pororsity of the strata containing the petroleum and gas, render it possible to estimate the total volume of hydrocarbons and facilitate the extraction of the maximum possible—operators must know and work upon the volume of gas and petroleum coming to the surface. In distilling, likewise, the fractions must be recorded by volume.

"Indication by volume is used for nearly all the other liquids—water, wine, beer, milk, etc.,—whether produced, stored, transported, or consumed. Thus it is reasonable to inquire why quantities of petroleum or derivatives imported or exported are stated in tons—while petrol, kerosene, etc., are sold by the gallon or litre.

"The strongest argument adduced by those who uphold recording by weight is that indication in weight is absolutely constant, whereas the volume is variable and dependent on temperature and pressure. A kilogram of petroleum or gas has—in all conditions in which it may be used, as fuel or lubricant—equal quantity and consequently equal value, whereas a litre of petroleum varies, increasing with higher pressure and lower temperature, and diminishing with lower pressure and higher temperature. If, therefore, the quantity of a product is given in volume, to express it in invariable form there must—in addition to the volume—be recorded the temperature and pressure at which the measurement was made.

Weight Measure Difficult

"To express quantities in weight, however, likewise demands these measurements of temperature —and, in certain cases, of pressure, because the original computation of the petroleum and subproducts at the well and refinery is never made on scales, but always by volume. It is, therefore, impossible to calculate and express the weight corresponding to the volume, without first ascertaining the specific gravity, temperature, and pressure of the products. Seeing that the original measurement is inevitably made by volume and that in each case it is necessary to determine the temperature and pressure of the products, most of which are sold by volume, there seems to be no reason for converting this volume into weight when, by like calculations the variable volume originally ascertained can be determined and recorded in volumes absolutely invariable. The difficulties in making the conversions mentioned, necessary in the current operation of wells, refineries, etc., would be reduced to a minimum with tables indicating volume corresponding in normal conditions to average volume in different conditions of temperature and pressure.

Need International Agreement

"The most convenient solution of the problem, therefore, would be the concluding of an international agreement establishing indication by volume alone, in units of the metric decimal system —applying, however, not the volumes originally ascertained in the varying physical conditions prevailing in the different countries, but volumes converted to correspond to physical conditions

agreed upon and uniform for the whole world. To hasten forward such arrangement as much as possible and to end the confusion in statistics, it would appear advisable to include this problem in the agenda of the next World Petroleum Congress—to settle it once and for all."

Consumer Standards Committee Names Brightman Chairman

H. W. Brightman, vice-chairman, Merchandising Division, National Retail Dry Goods Association, and vice-president in charge of merchandising, L. Bamberger & Co., New York, was elected chairman of the Advisory Committee on Ultimate Consumer Goods at its organization meeting October 29.

Miss Ruth O'Brien, U. S. Bureau of Home Economics, was named vice-chairman of the committee.

The Advisory Committee, which will coordinate and direct all standardization work on consumer goods under the American Standards Association, brings together for the first time accredited representatives of all outstanding consumer groups and retail organizations to cooperate in establishing national consumer standards.

Work on standard specifications for shrinkage and sheets, hosiery, bedding, and upholstery is already going forward in subcommittees of the Advisory Committee.

The committee has a widely representative membership of consumer and distributor organizations. Members are:

American Association of University Women, *Dr. Faith Williams*

American Home Economics Association, *Ruth O'Brien, Mrs. J. C. Taylor (alt.)*

General Federation of Women's Clubs, *Mrs. J. J. Doggett*

National Association of Purchasing Agents, *F. A. Renard, L. F. Boffey (alt.)*

National Congress of Parents and Teachers Associations, *Florence Fallgatter, Ruth A. Bottomly (alt.)*

National League of Women Voters, *Mrs. Harris T. Baldwin, Mrs. Beatrice Pitney Lamb (alt.)*

National Retail Dry Goods Association, *H. W. Brightman, F. W. Binzen, D. M. Nelson, J. D. Runkle, H. Freedman, T. L. Blanke*

U. S. Department of Agriculture, Bureau of Home Economics, *Dr. Louise Stanley, Dr. Day Monroe (alt.)*

U. S. Department of Commerce, National Bureau of Standards, *Dr. A. S. McAllister, I. J. Fairchild*

U. S. Department of Labor, Consumers' Project

SAE Standards Committee Reports Recent Activity

Projects on crankcase oils before the Lubricants Division of the Society of Automotive Engineers' Standards Committee are to be reviewed by a new subdivision, just organized.

Professor L. C. Lichty, Yale University, is chairman of this subdivision, and J. C. Geniesse, Atlantic Refining Company, is secretary. Other members are:

E. W. Upham, Chrysler Corporation
K. G. Mackenzie, Texas Company
H. C. Mougey, General Motors Corporation
G. M. Maverick, Standard Oil Development Company
J. L. McCloud, Ford Motor Company
G. L. Neely, Standard Oil Co. of California
W. H. Graves, Packard Motor Car Company
G. A. Round, Socony-Vacuum Oil Company, Inc.
W. S. James, Studebaker Corporation
A. L. Clayden, Sun Oil Company

The Lighting Division of the Standards Committee is continuing its study of automobile headlighting and is also reviewing specifications in the *SAE Handbook* for signal lamps, tail lights, and other lighting equipment, with a view to bringing these specifications into line with modern practice. This is being done with the help of state regulatory officials, the Illuminating Engineering Society, and other interested groups.

A revised standard on fan belts and pulleys will be included in the 1937 edition of the *SAE Handbook*, the Standards Committee plans. A subdivision of the committee, headed by E. D. Herrick, Lycoming Manufacturing Company, is redrafting the present standard on the basis of recommendations which have been submitted to the SAE by a rubber belting committee of the Rubber Manufacturers Association.

Name Stegner Chairman of Committee On Fire-Extinguishing Equipment

C. M. Stegner, Building Commissioner, Cincinnati, has been appointed chairman of the Sectional Committee on Requirements for Fire-Extinguishing Equipment. The committee is being organized under the Building Code Correlating Committee of the American Standards Association.

The National Fire Protection Association will act as administrative director for the work of the committee.

Applying Standardization to Surgical Methods[1]

by

Harry S. Warfield

Superintendent,
St. John's Riverside Hospital,
Yonkers, N. Y.

THERE is no place where standardization is of greater value than in a large institution, such as a general hospital, which requires a wide variety of articles intended for daily use.

The standardization of drugs and the endless number of items that fall under the heading of medical and surgical supplies, is one of the tremendous problems that face the modern hospital. A trying phase of this problem is the question of standard instruments which will be entirely acceptable to the surgical staff.

This is brought about of course by the wide variety of patterns of standard instruments, such as hemostats, scissors, tonsil forceps. Surgeons on the staff of each hospital make different selections. There are so many varied patterns on the market that even though a hospital has adopted four or five patterns of hemostats that are well known by name, there is still confusion because of the slight differences in patterns as made by the several manufacturers.

Standard Prevents Variation

Unless the hospital has a standard sample which is not in use in the operating room but is held as a standard by the purchasing department or the operating supervisor, each time a new lot of instruments is purchased there may be a variation in pattern, even though this was not desired. This variation may be in the length of the instrument, rigidity of the shank, style of rachet, width or length of jaws, depth of serrations in the jaws, size of the mouse tooth or any of the other variations with which we are familiar.

As a result of these slight differences, in a few years the operating room has a conglomeration of instruments, and the surgeon is often annoyed by the fact that when he calls to his assistant or the instrument nurse to hand him a forceps, for example, he may get one slightly different in pattern from the one he had just applied in the same operation a few moments before. This has a tendency to break the technique and slow up his work.

Adopt Uniform Instruments

With this thought in mind, I have been working on the problem for several years, in cooperation with an active member of our staff and the operating room supervisor, with the result that at last our surgical staff has selected and adopted a uniform set of instruments of the highest quality and design procurable.

A special cabinet has been built, attractive in appearance. This is kept locked, the key being in the custody of the operating room supervisor. The back of this cabinet is made of polished bakelite, on which are placed the proper number of chormium plated hooks. On these hooks are hung one each of the instruments in general use by our surgeons. There is also a drawer to accommodate sundry items, such as rubber catheters and other small instruments which cannot well be hung on hooks.

The cabinet was completely set up with instruments hung in their proper places, and a photo-

[1]Abstract from an article published in *The Modern Hospital*, January, 1936.

graph was made. Each instrument was numbered, and on the back of each photograph a typewritten list was pasted with corresponding numbers, giving the proper name and pattern of each instrument which had been adopted in the standardization plan.

The purpose of the cabinet is to keep constantly in display a full line of the instruments for the benefit of surgeons and nurses, and to make it possible, when requisitions are put through, to have the new instruments conform exactly with the standard pattern, in quality, pattern, size, and type.

There is an important economic side to the standardization of surgical instruments. When the hospital wishes to order several dozen of one pattern of instrument, for example, it sends out its requisition for bids to several supply houses. If it just mentions Ochsner forceps, 6¼-inch, or mosquito forceps, 5-inch, or towel clamps, 5½-inch, or in fact any other instrument that is recognized by its name, there is no way of knowing what pattern will be supplied after the award is given to the lowest bidder, quality considered.

Much can be gained, therefore, if when specifying the instruments on the requisition, the purchasing agent can specify also that the instrument must conform with the standard sample which may be examined at the hospital, and which is on constant display in this standardization cabinet. The instruments in the cabinet are not to be used, as they are simply to show type, style, and pattern.

When standardization is once adopted by the surgical staff of the hospital, it is a simple matter to continue replacing instruments and adding to the surgical equipment according to these standards. This results in saving to the institution and at the same time simplifies the work of the operating staff, and is most helpful to the surgeon.

Coal Committees Report Progress

Definitions for commercial purposes of coal varieties other than those of rank and grade are desirable, the Technical Committee on Coal Classification of the Sectional Committee on Classification of Coals decided at its meeting October 19 and 20. The committee will recommend to the sectional committee that such definitions be prepared by the Technical Committee on Nomenclature. Subcommittees of the Technical Committee on Coal Classification, which held meetings at the same time, reported to the Committee.

Several Years of Study

The Subcommittee on Origin and Composition of Coal and Methods of Analysis reported that the present knowledge of types of coal does not permit the preparation at this time of specifications for classification of coals based on the origin of plant components comprising various types or varieties of coal, such as common coal, splint coal, or cannel coal. The subcommittee has spent several years in an intensive study of this problem.

Progress in a statistical study of analyses of coals of unusual physical and chemical characteristics occurring in the high volatile bituminous and sub-bituminous ranks was reported by the Subcommittee on Boundary Lines for Coal Classification. The study is being made with the idea that a note may be included in the Tentative Specifications for Classification of Coals by Rank (D 388-35 T), indicating that the specifications do not apply to such unusual coals. These coals do not occur abundantly, are of relatively minor commercial importance, and can be excluded from the system of classification by rank by reference to their fixed carbon and calorific values.

Charts showing factors to be considered in selecting coal for various uses have been completed by the Subcommittee on Correlation of Scientific Classification with Use Classification. These charts give the weighted opinions of many authorities concerning the relative importance of various chemical and physical properties in selection of coal for specific uses. The subcommittee plans to publish these charts soon.

Recommends Revisions

The Subcommittee on Defining Coal Sizes and Friability recommended revisions of the Tentative Specifications for Classification of Coals by Grade (A.S.T.M. D 389-34 T) to include designating the size of coal in accordance with the method as given in the Tentative Method for Designating the Size of Coal from its Screen Analysis (A.S.T.M. D 431-36 T). This recommendation was approved by the technical committee.

Proposed New Standards Define Fruit Juice, Molasses, Cheese

NEW definitions for fruit juice beverages and revised definitions for molasses and cream cheese were proposed by the Food Standards Committee of the U. S. Department of Agriculture at its meeting September 28 to October 2.

The committee invites criticisms and suggestions from food officials, consumers, and the industry on these proposed definitions. Comments should be addressed to W. S. Frisbie, chairman, Food Standards Committee, Food and Drug Administration, Washington, D. C.

The proposed and revised definitions are:

Orangeade.—The beverage consisting of orange juice, sugar and water. It contains not less than 25 per cent of orange juice. The acidity may be increased by the addition of lemon juice.

Lime Rickey.—The beverage consisting of lime juice, sugar and carbonated water. It contains not less than 7 per cent of lime juice.

Molasses.—The product which remains after separating sugar from the clarified and concentrated juice of the sugar-cane. It may be "light" or "dark". It contains not more than 25 per cent of moisture and not less than 55 per cent of total sugars (sucrose plus reducing sugars). Reducing sugars are calculated as invert sugar.

Light molasses is molasses which contains not less than 62 per cent of total sugars.

Dark molasses is molasses which contains not less than 55 per cent of total sugars.

Cream Cheese.—The soft, uncured cheese made from curd obtained by the action of either lactic fermentation or rennet, or both, on milk enriched with cream. The curd, heated or unheated, salted or unsalted, is drained by gravity and light pressure. The finished product contains not more than 52 per cent of water and, in the water-free substance, not less than 65 per cent of milk fat.

The Food Standards Committee is appointed by the Secretary of Agriculture. Three of its nine members are state men representing the Association of Official Agricultural Chemists, three are state men representing the Association of Dairy, Food, and Drug Officials, and three represent the Department of Agriculture.

Mellon Institute Fellowship Finds Facts for Standards

A Fellowship at the Mellon Institute of Industrial Research furnishes facts for labels used by Kaufmann's, Pittsburgh, says a news item in *Domestic Commerce*, July 20. The Fellowship was founded in 1931, as the result of requests for actual data about staple items purchased.

Since 1931, the one Fellowship has expanded to three. Duties of Kaufmann Fellows now include research and creation of new products, the evaluation of competitive merchandise, and the appraisal of all merchandise before submitting it for sale. This mass of testing data accumulated over the past years is ready now for release in the form of Specifications Standard labels, according to the recent news article.

"Items which bear the Specifications Standard labels are staple items and the labels are guarantees of quality," says *Domestic Commerce*. "Only 132 kinds of merchandise now carry the new labels of Specifications Standards, but hundreds more will be evaluated and labelled, until all of Kaufmann's Staple merchandise will be made to the quality specifications that science proves best and will carry the Specifications Standards label.

"The specifications themselves will be made more precise and rigid as products are improved by better methods of manufacture and as this movement becomes more widely recognized in industry. These specifications are minimum ones."

Revise Recommendation For Cotton Duck

A revision of Simplified Practice Recommendation R27, Cotton Duck, has been accepted by industry, and became effective November 1, 1936, according to an announcement by the Division of Simplified Practice, National Bureau of Standards.

The revision adds four widths in two numbers of wide duck to the original listing of standard numbers and regular widths of sail and white duck.

Until printed copies are available, complimentary mimeographed copies of this Simplified Practice Recommendation may be obtained from the Division of Simplified Practice, National Bureau of Standards, Washington, D. C.

Use of American Standard Pipe-Thickness Schedules

by

Arthur McCutchan

Engineer, Engineering Division
The Detroit Edison Company

THE American Standard for Wrought Iron and Wrought Steel Pipe[1] was approved as a tentative standard by the American Standards Association in November, 1935. This standard contains tables of dimensions and nominal weights of pipe covering a wide range of service conditions. These tables are designed to meet the diversified needs of the piping industry with the smallest practicable number of pipe wall thicknesses in each size. The primary purpose of the standard is to reduce unnecessary duplication in the manufacture of pipe and particularly to effect a reduction in the pipe carried in jobbers' stocks to the extent that jobbers will find it possible to stock for immediate delivery the more commonly used grades of pipe in the thicknesses listed in the schedules. It is not the intent to rule out special thicknesses where the quantity of pipe desired warrants a special rolling at the mill, but rather to set up standard schedules to facilitate purchase of smaller lots of pipe.

The schedule numbers used in the standard tables approximate values of the expression $1000 \times P/S$. Thus Schedule 40 is roughly suitable for a service pressure of 400 lb per sq in., provided an allowable stress of 10,000 lb per sq in. is satisfactory for the particular pipe material under the type of service and temperature conditions involved.

[1] B36.10-1935.

The preface to this standard for pipe thickness states that it is intended the user will compute the theoretical wall thickness as described in detail in the A.S.M.E. Boiler Code, the American Tentative Standard Code for Pressure Piping (ASA B31-1935) or similar codes. And, that the value of allowable bursting stress to be used in such computation is to be obtained from the code or design rules selected. The nominal schedule thick-

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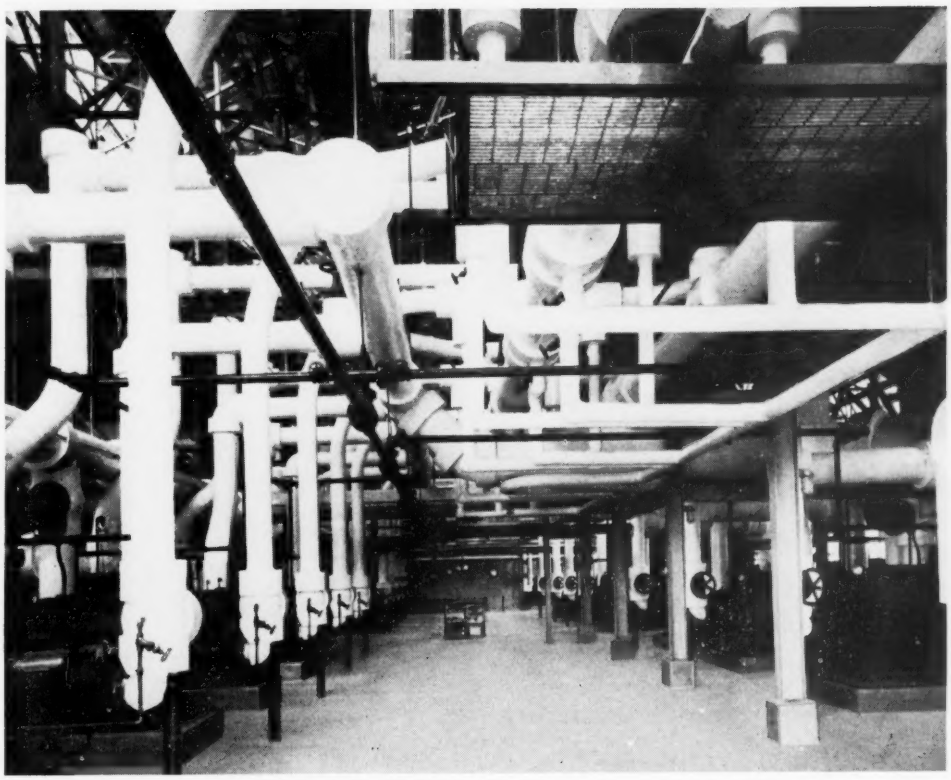
Two articles about the use of the American Standard for Wrought Iron and Wrought Steel Pipe (B36.10-1935) are being published in *Heating, Piping, and Air Conditioning*.

Part 1, an abstract of which is presented here, describes the standard and explains how the schedules of pipe wall thicknesses are used. In the original article (*Heating, Piping, and Air Conditioning*, October, p 531) an example showing the method of selection of the schedule of pipe thickness is given. Tables of the dimensional properties of pipe, compiled from the standard and from the American Tentative Standard Code for Pressure Piping (B31-1935), and used in computing steam and water velocities, pressure drops, and flexural characteristics of pipe lines, are presented.

Part 2 will describe piping design problems for which these tables can be used to particular advantage, and will give similar tables for other schedules.



Courtesy Mechanical Engineering

Pipe lines, conveyors of energy and materials, form indispensable links between plant-equipment units

ness which corresponds most nearly to this computed thickness, after making proper allowance for under-thickness mill tolerance, is then selected.

In order to avoid the appearance of complexity, it should be emphasized that for the general run of low pressure uses where "standard weight" and "extra strong" pipe are traditionally employed, computation of the wall thickness is unnecessary. The pipe wall thicknesses corresponding to "standard weight" and "extra strong" pipe are given in bold face type in Schedule 40 and Schedule 80, respectively, of the American Standard for Wrought Iron and Wrought Steel Pipe.

It seems desirable to point out that the formula given in the preface to this standard, which was used in establishing consistent pipe wall thickness schedules, differs somewhat from the formulas intended for use in design. The following formula, given in the American Standard Code for Pressure Piping (B31-1935) is satisfactory for general design purposes.

$$t_{min} = \frac{PD}{2S} + C$$

where

t_{min} = minimum pipe wall thickness allowable on inspection, inches.
P = maximum internal service pressure, lb per sq in.
D = outside diameter of pipe, inches.
S = allowable bursting stress in material, lb per sq in.
C = allowance for threading, mechanical strength, and/or corrosion, inches.

The value of C is required to be not less than that given in the 1935 version of the Code for Pressure Piping.

The value of allowable stress S for a number of classes of carbon steel pipe for different service conditions is given in the 1935 version of the Code for Pressure Piping.[2]

Additional requirements in the use of this formula for determining pipe wall thicknesses for all these classes of service are that pipe lighter than Schedule 40 shall not be threaded and that the value of P shall not be taken at less than 100 lb per sq in. gauge for any conditions or material.

[2]Tables A and B in the original article are compilations of these values as given in the several sections of the Code.

In the case of gas and air piping to be buried beneath streets the minimum value of P is given as 185 lb per sq in. gauge. It also is required that where steel pipe is threaded and used in power piping systems for steam pressure in excess of 250 lb per sq in. or water over 125 lb per sq in. and 220 F the pipe shall be seamless of a quality at least equal to A.S.T.M. A106 and of a weight at least equal to Schedule 80 in order to furnish additional mechanical strength. Seamless pipe of Schedule 80 thickness and of a quality equal to A.S.T.M. A106 is also required for threaded construction in district-heating piping if the steam pressure exceeds 125 lb per sq in. or water is at 220 F or higher and/or a pressure over 175 lb per sq in. Only seamless carbon steel pipe or a seamless high temperature resisting alloy pipe is permitted in oil piping systems above 750 F.

For all ordinary low pressure and low temperature services where threaded pipe is used, the foregoing requirements automatically dictate use of Schedule 40 pipe, which in sizes 10 in. and smaller conforms to the old "standard weight" dimensions. Consequently no calculation of pipe thickness is necessary. In selecting pipe for van stoned or welded construction, however, the minimum thickness on inspection must in general be computed and the schedule selected which will allow for the 12½ per cent under-thickness mill tolerance.

Example Shows Selection of Pipe Thickness Schedule

An example showing the selection of the schedule of pipe thickness suitable for the superheated steam lines of a power piping system should clarify this calculation of pipe thickness. Assume steam conditions are 380 lb per sq in. gauge, 700 F, and that it is desired to find the proper schedule of pipe thickness for a 16 in. O.D. van stoned line using Grade A seamless pipe conforming to A.S.T.M. Spec. A106. The minimum thickness on inspection is found from the formula

$$t_{min} = \frac{PD}{2S} + C$$

where, (in this case)

P = 380 lb per sq in. gauge
D = 16 in.
C = 0.065 in. as given in Table A for plain end pipe
S = 9,600 lb per sq in. for Grade A pipe of A.S.T.M. A106 at 700 F as given in Table B

$$t_{min} = \frac{380 \times 16}{2 \times 9{,}600} + 0.065$$

$$t_{min} = 0.3816 \text{ in.}$$

The least nominal thickness allowing for a 12½ per cent under-thickness mill tolerance would therefore be 0.3816/0.875 = 0.437 in. The nearest heavier schedule thickness is 0.500 in., which is Schedule 40. With the exception of the smaller pipe sizes which if threaded require Schedule 80 pipe it will be found that Schedule 40 is suitable for all the pipe sizes which may be used in the superheated steam system of this particular plant. This follows from the fact that schedule numbers represent consistent relations between the working pressure and the allowable stress. It is not recommended, however, that the wall thickness be computed for merely one pipe size and the assumption made that for the same service conditions, wall thickness can be selected indiscriminately from the corresponding schedule. The wall thickness for each pipe size should be computed individually and the correct wall thickness chosen from the tables. As mentioned previously, the schedules only *approximate* values of the expression $1000 \times P/S$.

Tables of Properties of Pipe Prepared

Since a single schedule of pipe wall thicknesses may cover the entire range of pipe sizes in a given service, the dimensional properties of pipe used in computing steam and water velocities, pressure drops and flexural characteristics of the lines can be conveniently grouped in tables for each schedule number. A series of tables[3] giving the properties of pipe most commonly required in making such calculations has been prepared covering the schedule numbers from 10 to 160, inclusive. Because the lower schedule numbers do not extend below the 8 in. pipe size and because Schedule 40, which corresponds to "standard weight" pipe in sizes 10 in. and smaller, is considered one of the basic schedules it is presented as Table 1. Table 2, covering pipe lighter than Schedule 40, sometimes referred to as "thin wall" pipe, gives the properties of Schedules 10, 20 and 30 pipe.

It is probable that these lighter schedules will be extended to the smaller pipe sizes when the advantages of welded construction are more fully realized as was pointed out by Mr. F. L. Snyder in the August, 1935, *Heating, Piping and Air Conditioning*, but at the present time designing engineers hesitate to use pipe which in some cases is less than half as heavy as "standard weight" pipe even when due cognizance is taken of the elimination of threads.

The second part of this article will describe some of the problems of piping design for which these tables can be used to particular advantage and will present similar tables for the basic schedules 80, 120 and 160 and the intermediate schedules 60, 100 and 140.

[3]This series, compiled from the standard, is given in full in the original article, *Heating, Piping, and Air Conditioning*, October.

Standard Pipe Plugs For Standard Fittings

An American Standard for Pipe Plugs of Cast Iron, Malleable Iron, Cast Steel or Forged Steel (B16e2-1936) has been approved by the American Standards Association. These plugs are to be used in connection with fittings covered by the American Standard for cast iron screwed fittings (125 and 250 lb) and for malleable iron screwed fittings (150 lb).

Formerly, the design of the square heads used for screwing these plugs into fittings or any tapped hole was a matter of manufacturers' and users' individual design. As these plugs are not only used in connection with pipe fittings but in many other services where it is necessary to plug up a hole, such as drain connections on various equipment, they are used in large quantities by the automobile industry and builders of machinery, as well as pipe fitters. Accordingly, the dimensions of the square heads and the sockets have been made to conform to the sizes of standard open-end wrenches and the maximum dimensions of hot rolled steel bars, respectively.

This standard for pipe plugs was formulated by the Sectional Committee on the Standardization of Pipe Flanges and Fittings organized in October, 1921, under the procedure of the American Standards Association and sponsored by the Heating and Piping Contractors National Association, the Manufacturers' Standardization Society of the Valve and Fittings Industry, and the American Society of Mechanical Engineers.

Copies will be available soon at 35 cents each, and may be ordered through the American Standards Association. Members of the ASA are entitled to 20 per cent discount.

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Standard Clarifies Instructions For Preparing Micrographs

More specific instructions for laboratory procedure for preparing micrographs of metals and alloys and for photographing metals have been approved in a revised standard just approved by the American Standards Association. The revision was prepared by the Committee on Metallography of the American Society for Testing Materials.

The revised standard, American Standard Rules Governing the Preparation of Micrographs of Metals and Alloys, Including Recommended Practice for Photography as Applied to Metallography (Z30.1-1936; A.S.T.M. E2-36) will soon be available at 25 cents per copy.

Revised Castings Standard Adds New Service Pressures

Higher and lower service pressures for power piping and oil piping temperatures below and above 750 F are included in the revised standard specifications for castings, just approved by the American Standards Association.

The revised standards, American Standard Carbon-Steel Castings for Valves, Flanges and Fittings for High-Temperature Service (G17.1-1936; A.S.T.M. A95-36) and American Standard Forged or Rolled Steel Pipe Flanges for High-Temperature Service (G17.3-1936; A.S.T.M. A105-36) will soon be available at 25 cents each.

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State Vehicle Administrators to Discuss Uniform Trailer Laws

Chief subject to come before the annual meeting of the American Association of Motor Vehicle Administrators to be held at Hot Springs, Ark., November 12-14, will be the regulation of tourist trailers. Increasing use of these is recognized as constituting a new traffic hazard which should be met so far as possible by uniform State laws and regulations.

At least 38 State motor vehicle administrators are expected to bring to the meeting concrete proposals for tourist trailer regulation and from these the administrators will draw up a code for presentation to the various State legislatures.

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SAE to Revise Glass Standard

The specifications for plate glass of the Society of Automotive Engineers are being revised to correlate them with the American Tentative Standard specifications and tests for safety glass for motor vehicles, recently approved by the American Standards Association. W. H. Graves, chief metallurgist, Packard Motor Car Company, is chairman of the subdivision of the Standards Committee's Passenger Car Division which will revise the specifications.

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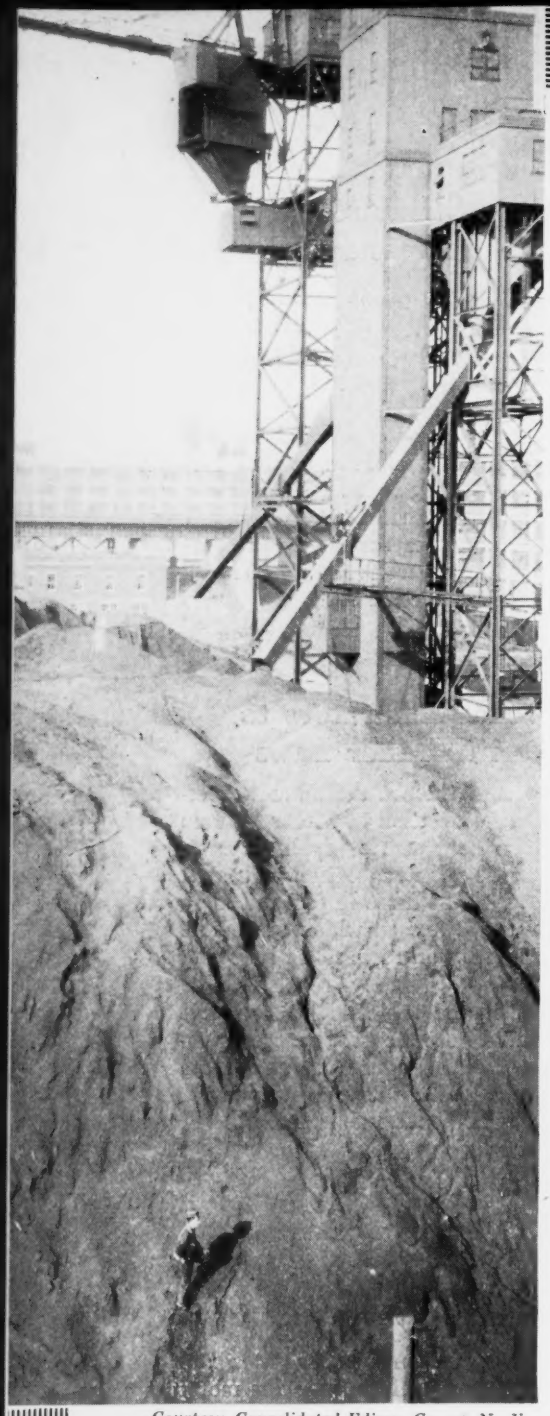
Octane Rating Should Be 74-81

The range of octane numbers for Premium gasoline was listed on page 258 of INDUSTRIAL STANDARDIZATION, October, as 74-61. This range should have been listed as 74-81.



Courtesy Consolidated-Edison Co. of N. Y.

How Do You Order Your Coal?

The American Tentative Standard Classification of Coals by Rank - 25 cents
(ASA M20.1-1936; A.S.T.M. D388-36T)

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